SALT MINCED FISH TRIALS

by

L.W. Regier, M.B. Wojtowicz, M. Fierheller and S. Varga
Technology Branch, Fisheries Management
Fisheries and Oceans Canada
Halifax, Canada

Abstract

The advent of meat bone separators for providing a minced flesh in high yield from many species presents many new opportunities for fish utilization. Salting of the minced flesh provides a rapid and inexpensive method for preservation.

Salted mince has been shown to require drying or an inhibitor such as sorbic acid to prevent microbial spoilage on long-term storage at ambient temperatures. Initial food-use trials of a dried shredded form in ten countries have met with mixed responses. Generally good acceptance was indicated in those locations which have traditionally used salt fish.

INTRODUCTION

The recent application of meat-bone separators to fish has presented many new opportunities. The bones, which are one of the major objectionable factors in fish for many people, can be effectively removed from fish flesh. Also, greater yields of edible flesh can be obtained from the fish. In cases where the fish are traditionally hand filleted and only the fillet used for food, as much as 100 percent more flesh can be recovered by use of the meat bone separators. The major uses of machine separated flesh have been in the washed and frozen or washed and cooked forms as represented by the surimi and kamaboko of Japan. Since the mincing operation mixes any spoilage organisms throughout the flesh, there is the potential for microbial spoilage that shortens storage life in the wet form. Therefore, methods are needed for utilization and preservation of minced fish flesh that are not dependent upon refrigeration. This is especially pertinent in areas where integrated refrigeration systems for the storage and distribution of food products are not already in place. Salting preservation presents one solution to this problem and a rapid salting technique has been studied in our laboratory as a response to this need.

TRADITIONAL SALTING

When whole or split fish are salted in traditional methods, a period of several days to several weeks is needed for the salt in contact with the surface to dissolve and diffuse into the flesh to fully salt out the proteins. At the same time, of course, there is diffusion of water out of the flesh forming free brine on the surface. At this point of full salting the product is stable for a short time but must be kept cool or it will spoil microbiologically. To further stabilize the traditional salt fish, it is normally dried. Much of the traditional dried salt fish, however, is still not at a low enough water content to make the product biologically stable. During drying, the rate of diffusion of water out of the flesh is normally the limiting factor, for the maximum drying temperature must be kept low or the fish cooks. Also, rapid drying can lead to 'ease hardening' in which a crust forms that greatly decreases the rate of drying.

SALTING OF MINCED FISH

There are several different approaches that may be taken in salting minced fish:

(a) Salting minced in block form. In this approach the minced flesh is formed into a block which is then handled in the traditional way. However, this allows the spoilage organisms in the central portion of the block to act before it is salted.

(b) Partial salting and drying. Here the mince is mixed with some salt that will be effective in inhibiting some of the spoilage organisms and then it is dried. Since the proteins are only partially salted they form a gel which is very difficult to dry and later to desalt for cooking.

(c) Full salting of mince. With this approach enough fine salt is mixed with the mince to fully saturate the water which is present in the flesh. Free brine is formed which can be removed efficiently by pressing or centrifuging. This product still is susceptible to the slow spoilage of red bacteria or moulds, for it has the water activity of a saturated salt solution which is equivalent to 75 percent relative humidity.

MICROBIAL STABILITY OF SALT MINCED FISH

Fully salted (equivalent of saturated salt solution) minced fish can be kept free from apparent spoilage by the red bacteria by storage below 8°C. This is essentially what has been done with traditional salt fish in the cool climate areas.

Two methods for prevention of this spoilage were investigated in our laboratories—drying, and addition of sorbic acid. The latter is an approved food additive in many countries.

When salt minced fish was inoculated with cultures of the red bacteria, it was again shown that a level of water content equivalent to 70 percent relative humidity was the limit for growth of the spoilage organism. In our salted minced fish this was at about 24 percent moisture. Thus a product with a moisture level below this was found to be shelf-stable at ambient or slightly abusive temperatures (up to 35°C for many months).

Later studies with sorbic acid added to the salt showed that a level of 0.3 percent sorbic acid (calculated on the wet mince basis) was effective in preventing the spoilage even when the mixture was inoculated with the red bacteria. Using this approach, a non-dried product containing 0.36 percent sorbic acid was shown to be microbiologically stable for several months at 35°C. The product had 40-45 percent water, 24-26 percent salt and 30-35 percent fish solids (mostly protein). When desalted with 10 times its weight of water, the final ready-to-eat material had about 0.1 percent sorbic acid.

PILOT TRIALS

A decision was made to proceed with pilot plant production and feeding trial before the results of the sorbic acid studies were available. The product was thus made using the drying method for preservation. A total of 6 tons of dried salt minced fish was prepared from split cod fish in the pilot plant of the Technology Branch Laboratory. This traditional readily available raw material was chosen for we needed a regular supply in 500 kg lots for pilot plant batches. The product from the pilot plant contained about 20 percent water, 40 percent salt and 40 percent fish solids (mainly protein). It was packaged in laminated foil-polyethylene bags in 1/2 kg quantities.

Through the kind cooperation of the Fisheries Prices Support Board Canada and the World Food Programme, this material was shipped to ten countries for trial.

USE TRIALS

Schools and hospitals were primarily used as the places for preparing and serving this trial product to consumers. The Fisheries Food Centre in Ottawa had prepared a variety of recipes for use of this salt minced fish and these were included with the brochure and questionnaire that was shipped along with the product.

Of the ten locations receiving the product, two were not able to carry out and report the trials as yet. In some of the trials reported, the product was over one year old at time of use.

In the eight reports, four indicated an enthusiastic to very favorable response to the product. Two of the locations indicated the product was acceptable but had some reservations about its use. Finally, two of the locations found the product unacceptable.

The six out of eight acceptable responses in themselves are quite encouraging. However, when we looked closely at the returned questionnaires we noted that the major objections to the salt minced fish came from places where the participants are not normal users of salt fish. There are indications that the salt minced fish was not properly desalted before use in the trials where the product was not accepted. One part of the problem may be the characteristic flavour of salt fish which is at first objectionable to those of us who did not grow up with the product.

These trials have thus shown that it is possible to produce a salt minced fish in good yield by a rapid process. The product is shelf-stable, when protected by packaging, for a long period and in fairly well accepted by consumers throughout the world.